# AI Platform to Accelerate API Economy and Ecosystem

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***Abstract*—Nowadays Enterprises are pursuing Digital Transformation to build a new business model and internal processes. Cloud Computing, Big Data, Mobile and Social are top subject and the direction is how to integrate their legacy process and make a convergence to new model. AI and Deep learning technology are rapidly emerged and becoming really critical of new solutions and the solution definitely uses cloud platform by API services and Pre-built assets. It drives API economy growth by global service providers' platform services. API Economy generates a lot of application diversity and platform provides the services, which can support Digital Transformation. Once they build their platform by themselves or 3rd party platform services, they should think about the expansion of their business via the collaboration of business partners. This collaboration model is ecosystem generation to build new partnership. By providing services to business partners they can expand customer who are dealing with business partners. The collaboration of platform service with business partner and the customer will be the new way of enterprise revolution as a part of the 4th industrial revolution.**

**Keywords—*Artificial Intelligence, Cloud Platform, API Economy, Ecosystem***

## I. Introduction

In 2017 at World Economic Forum Google Co-Founder Sergey Grin said; "I didn't see AI is coming"[1]. Now all of us recognize AI is here. Even AI Technology and convergence is growing faster than we think. IT global Service Provider are devoting to build cloud platform and put services of AI, IoT, Big Data on their cloud platform to support new business environment. These services bring us the explosion of API Application market by using cloud and the use of API service create startup and ventures and drive enterprise to a new industrial business areas. This network relationship builds an ecosystem to co-create market and to gain new customer, continuously enlarge the marketplace together. This digital transformation will keep changing the human living life and business way to work as an industrial revolution.

These changes are driven by AI and Deep Learning technologies. At the ImageNet Large Scale Visual Recognition Competition 2012 (ILSVRC 2012) the name of the deep learning group is SuperVision made 0.15315-error rate comparing 2$^{nd}$ team achieved 0.26172-error rate [2]. After this, everyone, in every vision competition, started using deep learning. Deep learning algorithm was distributed as open source framework by academy and global service providers. It made many use cases and applications.

Global service providers made AP services and pre-built assets on their cloud platform. It grows as killer-services and application. The leaders of service providers expect more than half of applications start to use AI, deep learning technology from 2017. The platform supports API economy that drives Startup and ventures business model and also reduces the barriers of new business to them.

Cloud Service is building new platform business type, which is service provider's ecosystem market. All of the enterprise are changing to a platform-based operation and expose their services to make a connection with business partners and customers. It really expands new customers by business partner's customer.

This article is focusing on how industry solutions are expanding by platform AI service model, how new market place are growing by ecosystem model and what is prepared for these changes.

## II. AI, Deep Learning Technology Evolution

With machine learning, algorithms automatically identify complex patterns in large data sets. For example, Google's AI learns how to translate content into different languages based on translated documents that are online and Facebook learns how to identify people on images based on its existing large database of known users. In particular, the progress of deep learning and reinforced learning, both branches of machine learning, have led to impressive results over the past five years.

The efficiency of AI systems also relies on the use of specific microprocessors in the cloud. The learning phase of deep neural networks relies on "Graphic Processing Units" (GPUs) processors that were initially designed for video games, such as those by NVIDIA. For the response phase, large AI companies often develop dedicated processors, such as Google's "Tensor Processing Unit" (TPU) or Microsoft's "Field Programmable Gate Array" (FPGA).

Machine-learning technology powers web searches, content filtering on social networks, recommendations on e-commerce websites, and is increasingly present in consumer products such as cameras and smartphones. Machine-learning systems are used to identify objects by classification, regression, clustering and so on.

The machine learning method depends on the kind of data that one has at one's disposal according to using input and output data. There are 'Supervised', 'Unsupervised' and 'Reinforcement' machine learning algorithms [3].

Unsupervised learning presents a learning algorithm with an unlabeled set of data – that is, with no 'right' or 'wrong' answers – and asks it to find structure in the data, perhaps by clustering elements together – for example, examining a batch of photographs of faces and learning how to say how many different people there are. Google's News service2 uses this technique to group similar news stories together, as do researchers in genomics looking for differences in the degree to which a gene might be expressed in a given population, or marketers segmenting a target audience.

Supervised learning involves using a labeled data set to train a model, which can then be used to classify or sort a new, unseen set of data (for example, learning how to spot a particular person in a batch of photographs). This is useful for identifying elements in data (perhaps key phrases or physical attributes), predicting likely outcomes, or spotting anomalies and outliers. Essentially this approach presents the computer with a set of 'right answers' and asks it to find more of the same. Deep Learning is a form of supervised learning".

Reinforcement learning (RL) is an area of machine learning inspired by behavior analysis of agents, which has feedbacks from environment. The machine tries out many other scenarios to look for maximum rewards actions, which is different from Trial-and-error and delayed reward.

Figure 1 is some of the popular open source deep learning frameworks of today. They have been categorized on languages supported, availability of tutorials and training materials, convolutional neural network modeling capability, recurrent neural network modeling capability, ease of use in terms of architecture, speed and support for multiple GPUs. Especially NVIDIA Deep Learning SDK adapts and ports these frameworks which are leading.




Fig. 1. Open source deep learning framework

## III. AI Platform Service

Cloud, Big Data, IoT and AI technologies are leading the change in explaining the many changes in the Fourth Industrial Revolution, and these technologies are used to create new business models through convergence and to change them into personalized and small quantity batch production, it is accelerating the structural changes of industrial production and O2O, CPS, Platform, Shared, OnDemand Economy. This demand is accelerating the digital transformation of enterprises.

Global IT companies have been investing in supporting services based on artificial intelligence technology under cloud-based corporate strategy long ago. Amazon's Amazon Web Service (AWS), MicroSoft's Azure Platform, Google's GCP (Google Cloud Platform) and IBM's Bluemix Service build BigData, IoT, Machine Learning, Deep Learning, and Cognitive Service on top of cloud services. The services of each company have the following characteristics.

### *1) Amazon's Amazon Web Service(AWS)*

AWS is one of the largest Cloud Platform companies with the most customers and solutions. AWS's announcement, in 2016, 159 significant features and services were delivered [4].

AWS has been investing deeply in artificial intelligence for over 20 years. AWS focused on bringing that knowledge and capability to customers through three layers. First, AI stack: Framework and Infrastructure with tools like Apache MXNet and TensorFlow. Second, API-driven Services to quickly add intelligence to applications. And last Machine Learning Platforms for data scientists.

AWS's API-driven Service is based on principles bring Intelligence to Any Application through an API call to pre-trained services rather than process directly modeling and training using with a vast amount of data and testing. For example, Amazon Lex uses the same technology as Amazon Alexa to provide advanced deep learning functionalities of automatic speech recognition (ASR) and natural language understanding (NLU) to enable users to build application with conversational interfaces, commonly called Chabot.

AWS provides Managed Machine Learning Platforms to Focus to on Building Powerful Models. This AI platform services remove the undifferentiated overhead associated with deploying and managing infrastructure for training and hosting. For example, Amazon Machine Learning provides visualization tools and that guide users through the process of creating machine learning (ML) models without having to learn complex ML algorithms and technology.

### *2) MicroSoft's Microsoft Azure*

Azure is a comprehensive set of cloud services that developers and IT professionals use to build, deploy, and manage applications through Azure's global network of data centers[5].

Azure claims the following features like Azure is productive for developers. First, Azure supports a range of operating systems, programming languages, frameworks, databases, and devices. Second, Azure is the only consistent hybrid cloud. Azure offers hybrid consistency in application development, management and security, identity management, and across the data platform. Third, Azure is the cloud for

building intelligent apps. This can develop innovative application by using basically provided AI. And last, Azure is trustable to use.

Azure provides a comprehensive set of flexible AI services for any scenario, and enterprise-grade AI infrastructure, modern AI tools designed for developers and data scientists. These are based on Reasoning that use user's unique data to augment, Understanding that interpret business and customer data in real time and scale including text, docs, images, video, voice, and Interacting that remove technology barriers with customers and multiply employee capabilities.

In Azure's AI services, customers can accelerate the development of AI solutions with high-level services. In AI services, there are three main categories. Cognitive Services, Azure Bot Service, Machine Learning Services. Cognitive Services provide

Cognitive Services are classified into five categories. Vision, has image-processing algorithms to smartly identify caption and moderate your pictures. Speech, convert spoken audio into text, use voice for verification, or add speaker recognition to app. Knowledge, map complex information and data in order to solve tasks such as intelligent recommendations and semantic search. Language, allow apps to process natural language with pre-built scripts, evaluate sentiment and learn how to recognize what users want.

Azure Bot Service has three big features, Accelerated development that speed up development by working an integrated environment that's purpose-built for bot development. Broader reach that increase interactions and reach more customers from website or app to email, GroupMe, Facebook Messenger, Skype, etc. Operational agility provision bot using options that let user scale up or down on demand.

Machine Learning Services has five main components. Azure Machine Learning Workbench, Azure Machine Learning Experimentation Service, Azure Machine Learning Model Management Service, Microsoft Machine Learning Libraries for Apache Spark (MMLSpark Library), Visual Studio Code Tools for AI. And these support accelerating data science project development and deployment.

*3) IBM's IBM Bluemix*

IBM Bluemix claims the following advantages if users use IBM Bluemix. First, users can focus on enterprise innovation. IBM Cloud is open by design, giving them the flexibility and control they need to leverage their skills and technology investments. Users can make their data make sense. They can more easily tap into and integrate the vast amounts of data available. Third, users infuse cognitive throughout their company. Cloud architecture is built so that they can easily apply AI and machine learning capabilities to their enterprise workloads. And last, they can tap into industry and technology expertise. With using Bluemix, they can continuously develop and deliver their solutions with speed using the newest tools and methods developed based on decades of experience and best practices[6].

Bluemix provides Watson AI platform. Waston service provides a wide range of features from image / video analysis to textual sensitivity / keyword / entity understanding. Especially in field of cognitive computing, Watson handles key analytical information, patterns, and relations such as unstructured images / emails / social media. And Watson can get useful analytics information in real-time social media trends with the integrated solution of Natural Language Classifier.

## IV. API ECONOMY ON PAAS PLATFORM

PaaS(Platform As A Service) on cloud platform provides "Pay as you go" model and their brands related to machine learning, deep learning and cognitive computing. Needless to say, the cloud has been a very large driving factor in the "App Revolution." It provides a fast, simple, and cost effective way to for startups and enterprises alike to deploy and host applications and mobile backends over the internet. Apps can be stitched together quickly with pre-built assets exposed as APIs - cloud has made this API Economy possible. Cloud changes Developer's behaviors and pre-built assets accelerate API economy.

Developers now expect to be able to deploy updates to their applications in seconds, to write their code in whichever tool or language they choose. Each has its own distinct "personality" and followings of developers have evolved around each of these to be able to continually integrate working copies of code into a shared mainline at multiple points during the day to focus on writing code, not on the administration of servers, virtualization, operating systems, and middleware, to "fail fast" - or ensure applications fail immediately and visibly to speed debugging and fixes, and to integrate useful APIs into their applications - who wants to write code that's already been written and tested?

Business Environment is getting changing to "Timing is critical". PaaS Benefits are easily setup business environment and deploy apps quicker. Global service provider manages the Infrastructure and the platform. PaaS also gives Time Commitment that is minutes to initial deployment - developer can handle everything on his/her own maintenance and upgrades of Platform and Infrastructure handled by service provider.

Pre-built Apps and API services makes barriers lower to customer rapidly to bring products and services by integrating their solution. And platform sevice continuously deliver new functionality to customer so that customer focus on their competitiveness.

Global service providers are focusing on building their Pre-Build Apps, Big Data driven AI, Machine Learning, Cognitive Computing services. It expands API Economy, lower the barrier to build service application and to enter into new business markets.

## V. PLATFORM REVOLUTION WITH AI BUSINESS MODEL, ECOSYSTEM

The industry has big-picture changes. The traditional business model that is Pipeline business model is changing. Until now Industry had focused on Production, namely manufacturing. And it expanded to Supply Chain Management, Customer Relationship management etc. We call it Pipeline business model. What's changed in this century is that information technology has profoundly reduced the need to own physical infrastructure and assets. IT makes building and scaling up platforms vastly simpler and cheaper, allows nearly frictionless participation that strengthens network effects, and enhances the ability to capture, analyze, and exchange huge amounts of data that increase the platform's value to all. You don't need to look far to see examples of platform businesses, from Uber to Alibaba to Airbnb, whose spectacular growth abruptly upended their industries.

A platform provides the infrastructure and rules for a marketplace that brings together producers and consumers as Fig. 2. The players in the ecosystem fill four main roles but may shift rapidly from one to another. Understanding the relationships both within and outside the ecosystem is central to platform strategy [7].

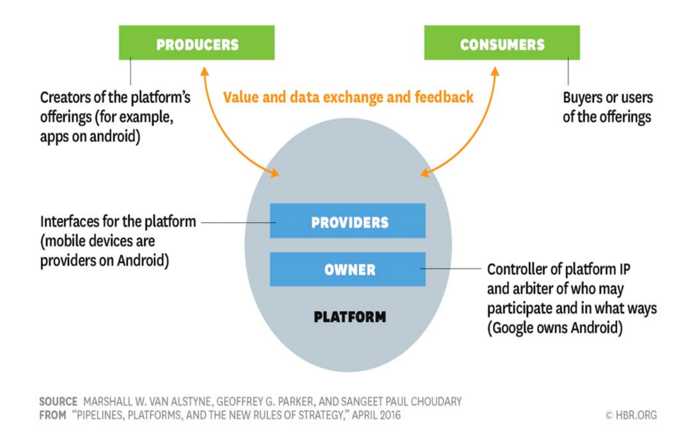



Fig. 2. Platform with producers and consumers

Figure 3 explains that platform remakes traditional value chain. Platform's Ecosystem has more powerful for industry transformations. It has Developers, Publishers, Contents owners and Retail Services. The platform has two-sided network's effect. And Ecosystem has his own customers. It makes double of two-sided network effect and more acceleration in new platform marketplace.

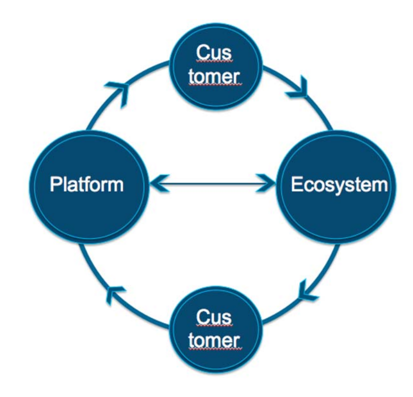



Fig. 3. Platform Ecosystem

## VI. CONCLUSION

Inspired by the recent success of AI and Deep learning technologies are changing industry application by using platform services. And platform service model has new ecosystem marketplace, it drives startup and ventures business and also enterprise expands their customers through ecosystem model. It gradually changes industry business way from pipeline model to platform revolution.

1) Industry application revolution

The industries are redefining boundaries [8]. New competition is emerging. The next wave of competitiveness will not be good assets and software package itself but knowledge base about the customer and the way of decision. Customers want to have more options and want to decide for themselves. The new business model should provide these requirements, get insights from what we don't see, which is invisible data in big data, and supports intelligence for the decision. Decision support solution will be new area of IT and expand the IT market [9]. Cloud platform API service is growing to enrich Decision support solution market.

2) Ecosystem marketplace revolution

Especially the transformation to Platform Company will be the new business channel to customer and business partners. It will reduce barriers to start-up and ventures, and also make new opportunities to business partners. It gives new market expansion as well. We will have new way of business from pipeline model to platform services.

In future work, we will investigate more advanced AI and deep learning techniques and evaluate more other diverse platform services for more in-depth empirical studies so as to give more insights for bringing the industry application model and platform model changes as a part of the $4^{th}$ industrial revolution as in the long term [10].

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